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SUBJECT: South China's Soil in Desperate Need of a Clean Up

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¶1. (SBU) Thirty years of "pollution first, treatment later" has led to a severe and growing soil contamination problem - perhaps more troubling health-wise than air and water pollution - in the Pearl River Delta (PRD). Excessive concentrations of heavy metals, pesticides, fertilizers and other carcinogens have been detected in many soil samples and food products from the region, with some studies finding excessive heavy metal contamination in about 50% of vegetable fields in Guangdong. Government control measures have so far been inadequate with more resources dedicated to air and water pollution. Programs to move highly polluting industries to special industrial zones have not included sufficient investment in waste treatment facilities at the new zones. As U.S. imports of Chinese agricultural products, especially seafood, grow, soil contamination in the PRD will be an increasing concern for U.S. consumers. End summary.

¶2. (SBU) The Director General of the Guangdong Department of Land and Resource has said publicly that the problem of soil contamination is very serious and the effect on products throughout the food chain, especially from heavy metal contamination, is a potential threat to human health. In addition to its direct effect on agricultural products, soil contamination leads to the deterioration of soil quality, reducing the productivity of farmland and creating a vicious cycle where more contaminating pesticides and fertilizers are used. Soil pollution - with heavy metals, pesticides, nitrate/nitrite and polycyclic aromatic hydrocarbons (PAHs) - is probably more harmful to the human health than air pollution with respect to total cumulative exposure and risk because food is the major exposure pathway for many of these harmful contaminants. Exposure is often cumulative without any symptoms at the beginning. High exposure to these chemicals over time has been linked to cancers, bone diseases and other health issues, including child development problems.

Heavy Metals

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¶3. (U) Many studies by local research institutes have shown that heavy metal soil contamination is very hard if not impossible to eliminate because the retention time is long, mobility in soil is slow and the contamination can't be degraded by microbes. Mining waste, waste water discharge from smelters and other industrial waste are major contributors. One survey in Guangdong of 179 monitoring sites covering a total area of 84,300 hectares found that soil pollution in 58.1% of samples exceeded China's standards; the latter are often much less stringent than U.S. health experts would

recommend. Another investigation of five cities in Guangdong, accounting for 66,700 hectares of farm land, showed 80% of samples with heavy metal pollution.

14. (U) Soil contamination leads directly to high levels of heavy metals in food grown in the PRD. A Sun Yan-Sen University study of local produce showed that lead levels in 37.5% of leaf vegetables and 26.3% of root vegetables exceeded Chinese standards. Cadmium levels exceeded the standards in 18.1% of leaf vegetables and 9.7 percent of root vegetables. One random inspection of vegetables in a Guangzhou market showed that about 30% exceeded the standard for lead concentration and 20% exceeded the standard for cadmium. Heavy metal concentrations in vegetables and other farm produce, especially rice, in highly polluted areas such as the area around the Dabaoshan Mine in Guangdong could be more than one thousand times higher than concentrations reported in U.S. produce by the U.S. Food and Drug Administration.

15. (U) The Chinese Journal of Food Hygiene in 2007 described a large study involving 43,976 measurements of various foods and various pollutants from 2000 to 2005. According to the study, rice in Guangdong was highly contaminated by cadmium. It found that consumption of just 0.4 kg of rice per day would result in exposure to cadmium at 84% of the acceptable daily intake established by the U.N. Food and Agriculture Organization and World Health Organization (FAO/WHO). Approximately 68% of dried mushroom samples exceeded Chinese standards for lead content.

#### Pesticides and Fertilizer

16. (SBU) Various chemical residues from pesticides and fertilizers in the vegetables and other farm produce are also high in the PRD due not only to direct application of excessive amounts but also from residual contamination in the region's soil. According to a 2003 report by the Guangdong Statistics Bureau, an average of 834 kg of chemical fertilizers were applied on each hectare of farmland each year, much higher than the international average of 36 kg/hectare annually. Wan Hongfu, a top expert on soil in PRD, told us excessive amounts of chemical fertilizers and pesticides have been used in PRD. He said that about 70% of the fertilizers and 70-90% of the pesticides end up polluting the environment and damaging the ecological system of the PRD. Inappropriate application of pesticides and defective products make the problem worse.

17. (U) Soil contamination studies have found the pesticides dichloro-diphenyl-trichloroethane (DDT) and beta-benzenehexachloride (trade name HCH) in nearly 100% of samples. Detection rates for other pesticides are also very high. In 2000, a market survey found that 67.1% of vegetable samples exceeded standards for one or more pesticides. In addition, the survey showed that 32.2% and 43.4% of samples exceeded standards for two unnamed pesticides that Chinese regulations prohibit for use on vegetables. A separate market survey by a government agency yielded less alarming results. It showed that about 10% of vegetables exceeded standards for at least one of 22 pesticides, including methamidophos, dimecron and others. The percentage of leaf and root vegetable that exceeded standards was much higher. In 1999, inspection of tea from Guangdong found that 30% of samples exceeded the standard just for DDT - with some exceeding the lead standard as well. The problem could be much more serious than these studies indicate because there is no testing for many other pesticides, including some that are reportedly used illegally.

18. (U) Nitrate and nitrite contamination in soil from fertilizer and sewage is also very serious in scale and degree. A paper published in 2007 by Guangdong Ecological Environment and Soil Research Institute indicated that 62.2% of sampled vegetables, especially leaf vegetables, were highly polluted by nitrate and nitrite. Another study put the rate for all vegetables at 70%. An inspection of Guangdong market produce found that 90% of all vegetables and 100% of leaf vegetables exceeded the standard for nitrate and nitrite with an average concentration of 2517 mg/kg (432 mg/kg is the recommended FAO standard). A separate investigation showed the concentration to be more than 1200 mg/kg in seven types of vegetables.

## Other Carcinogens

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¶9. (U) Contamination of polycyclic aromatic hydrocarbons (PAHs), which are carcinogenic contaminants from fossil fuel use, in soil in the PRD is another problem. Many PAH compounds are also mutagenic and cause birth defects. The detection rate according to some studies is more than 90% in PRD soil samples. In one investigation, the levels of five probable human carcinogenic PAHs exceeded standards in vegetable, rice, banana and orchid field soil samples in the following amounts -- benzo[b]fluoranthene 88%, benzo[k]fluoranthene 68%, benz[a]anthracene 13%, benzo[a]pyrene 4%, indeno[1,2,3-cd]pyrene 3%.

## Control Measures Inadequate

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¶10. (SBU) Pollution in south China is severe, widespread and takes many forms. The top goal of the Chinese government, especially at local levels, is to prevent a major environmental incident. Resources have been focused on drinking water and air pollution mitigation, such as reduction of sulfur dioxide emissions. Soil contamination has been neglected for a long time.

¶11. (SBU) Authorities in China are beginning to realize the seriousness of soil pollution and have started to take measures to improve the situation. A national survey of soil contamination status is ongoing and a national database of soil contamination should be established by the end of this year. The central government is working on the Soil Contamination Prevention Act, which is scheduled to be promulgated next year. This is a first step in the right direction. The key to protecting the soil is prevention, but it will be very hard to implement preventive measures since many call for small highly polluting factories to be closed or moved. According to a senior official and expert on soil research, about one-third of factories in the PRD would have to be

moved or closed to comply with the Act. This could lead to social instability, the top concern of authorities at all the levels of Chinese government.

¶12. (SBU) In Guangdong, the provincial government seeks to address pollution, including soil pollution, by transferring the polluting industries into industrial parks with improved monitoring and control. However, limited resources and the lack of local compliance reduce the effectiveness of this strategy. A total of 28 provincial transfer industrial parks have been created in Guangdong and, to date, not one has an operational waste treatment facility. Waste treatment plants are being built in only three of the 28 parks.

¶13. (SBU) Experts in Guangdong have urged the government to enhance inspection of vegetables in markets and establish no-hazard fields for vegetables. Lack of contamination data for foods and lack of openness regarding data that does exist make it difficult to know the real scope of the problem. Local scientists agree that studies similar in design to U.S. EPA studies assessing the total exposure of the various pollutants from various sources such as food, water, air and other pathways are important for measuring the cumulative risk of exposure for residents of the PRD. The percentage contributions from various pathways, pollutants, or industries could help direct resources to reduce the overall risk. These types of studies would also clarify the links between exposure, risk and health effects for PRD residents.

## Impact on the United States

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¶14. (SBU) South China's soil contamination problems are increasingly a U.S. concern. U.S. imports of Chinese agricultural and seafood products have grown rapidly in recent years, and China is now the United States' third largest source for these goods. U.S. imports of Chinese agricultural and seafood products increased roughly fourfold over the last ten years, from 433,000 metric tons (MT) worth approximately USD 1 billion in 1997 to 2.1 million MT and USD 4.9 billion in 2007. If these trends continue, the potential for Chinese soil contamination to threaten U.S. health will grow as well.

